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FOREST INDUSTRIES

DECEMBER 1990

1991 Equipment Catalog AND BUYERS' GUIDE

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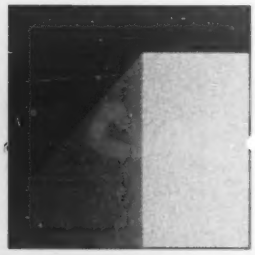

15 'Show and tell' is not just for kids anymore Loggers also have a responsibility to show off their work and tell people good forestry is environmentally sound

19 Special feature: Equipment Catalog This annual section gives prominence to new mill and logging machinery. Products range from new models introduced by heavy equipment manufacturers to small electronic components. All are designed to increase efficiency and productivity

28 FOREST INDUSTRIES Suppliers' Showcase This special advertising section puts products and literature in a whole new light, with a colorful presentation and short descriptions of products and services. Information described is available free from industry suppliers through a reader service card

31 Buyers' Guide, Part 1: Directory of Categories This is your road map to the 1991 Buyers' Guide, showing where to find products and service groups and individual categories in the classified pages of the Guide which follow

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VOLUME 117 NUMBER 10

PUBLISHER/EDITORIAL DIRECTOR David A. Pease EDITOR Mary Lou Corlett SENIOR EDITOR Ted Blackman MANAGING EDITOR Jennifer A. Sowle REGIONAL EDITOR John D. Bland ASSISTANT EDITOR Lisa A. Monson ADMINISTRATIVE ASSISTANT Emily N. Freeman PUBLICATION DESIGNER Jill Dupont

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Largest sawmillers dominate the industry

Despite a very small dip in North America's lumber production in 1989, the largest companies maintained their dominance of the softwood industry. This group of 20 companies, equally divided between Americans and Canadians, cut nearly one-third of the lumber produced last year in North America.

This is one result of an analysis of production figures from individual companies across the continent, gathered by FOREST INDUSTRIES editors and compiled into the 1990-91 edition of the *North American Factbook*.

The book includes production data from as many companies as possible that saw at least 1 million bd ft a year. This year, we found 811 of them; they operate almost 1500 sawmills. Undoubtedly, there are more—especially hardwood sawmills. The hardwood lumber industry is far more fragmented than the softwood side, with many hundreds of small mills whose aggregate output came close to 11 billion bd ft in 1989.

Of those 800-plus producers, a relative few accounted for the great majority of the lumber cut in North America. The 100 largest lumber producers—12% of the total companies who responded to our survey—operate 40% of the sawmills included. These 594 sawmills cut 44.14 billion bd ft of lumber (hardwood and softwood), or 60% of the lumber produced last year in North America.

The smallest of the "top 100" companies turned out 116 million bd ft; three companies tied at this level. The largest, Weyerhaeuser Co., produced 2.97 billion bd ft—more than 25 times as much as the 100th. Nine companies produced more than 1 billion bd ft, five in the U.S. and four in Canada. *(For information about ordering the book, see below.)*

During the past decade, the share of total production accounted for by the top 100 sawmillers has grown, from nearly 52% in 1980 to 57% in 1985 and 60% in 1989. There were small ups and downs in the "top 100's" share over the years, but the trend continues (see Table 2, next page).

Table 1 lists the top 20 lumber producers in the U.S. and Canada. Canada's largest producer in 1989, Canfor Corp., was only fourth on the list. That is the same spot occupied by Canada's largest lumber producer in 1988, only then the leader was Fletcher Challenge Canada. Canfor jumped ahead of Fletcher Challenge by acquiring Balfour Forest Products in mid-1989.

Louisiana-Pacific Corp. and Georgia-Pacific Corp. followed Weyerhaeuser on the list in 1989, just as they did in 1988. G-P may edge out L-P for second place when 1990 numbers are compiled, since its purchase of Great Northern Neekoosa Corp. this year added more than 200 million bd ft to its lumber capacity.

Noranda Forest Inc. appears on our list of the 20 largest lumber producers for the first time, in fifth place. In past years, we have listed Noranda's wholly owned subsidiaries under their own names; this year, we combined their totals.

However, companies not wholly owned by Noranda continue to have

TABLE 1—Top 20 producers, U.S. and Canada

Company name & headquarters	# of mills	1989 production (million bd ft)	Rank in 1988
1. Weyerhaeuser Co. Tacoma, Wash.	36	2,971	1
2. Louisiana-Pacific Corp. Portland, Ore.	57	2,441	2
3. Georgia-Pacific Corp. Atlanta, Ga.	46	2,426	3
4. Canfor Corp. Vancouver, B.C.	13	1,592	7
5. Noranda Forest Inc. Toronto, Ont.	10	1,463	N.A.
6. Fletcher Challenge Canada Vancouver, B.C.	11	1,296	4
7. WTD Industries Portland, Ore.	25	1,242	8
8. West Fraser Timber Co. Vancouver, B.C.	6	1,170	6
9. Weldwood of Canada Vancouver, B.C.	8	1,153	5
10. Sierra Pacific Industries Redding, Calif.	9	950	9
11. Boise Cascade Corp. Boise, Idaho	14	803	12
12. International Paper Co. Dallas, Texas	10	800	11
13. MacMillan Bloedel Vancouver, B.C.	8	792	10
14. RSG Forest Products Kalama, Wash.	6	786	13
15. Slocan Forest Products Richmond, B.C.	7	740	17
16. Champion International Corp. Stamford, Conn.	10	671	16
17. Donohue Inc. Montreal, Que.	8	620	33
18. Simpson Timber Co. Seattle, Wash.	9	615	22
19. International Forest Products Vancouver, B.C.	6	601	18
20. Westar Timber Ltd. Vancouver, B.C.	5	600	19

NOTE: Companies are ranked according to data gathered by FOREST INDUSTRIES.

TABLE 2—Comparative data, top 100 companies, 1980-1989 (million bd ft, hardwood and softwood; includes U.S. and Canada)

Year	Total volume reported by top 100 co.'s	Number mills in top 100	Total volume by year's top producer	Cutoff volume of year's 100th producer	Co.'s producing more than 1 billion bd ft
1980	28,037	641	2,889	80.000	4
1981	26,956	657	2,744	74.580	3
1982	26,043	603	2,147	71.000	4
1983	34,305	610	3,123	98.058	5
1984	35,870	585	2,989	100.708	5
1985	35,625	572	2,609	104.187	7
1986	38,238	554	2,553	119.832	6
1987	43,475	589	3,139	128.181	8
1988	43,786	601	2,942	128.765	8
1989	44,146	594	2,971	116.000	9

SOURCE: Data compiled by FOREST INDUSTRIES.

separate listings. WTD Industries of Portland, Ore., the continent's fastest-growing lumber producer, moved up another notch in 1989 to seventh. WTD, which didn't even exist 10 years ago, grew by rapid acquisitions of sawmills, most of which were shut down when the company bought them.

These 20 lumber producers manufactured more than 24 billion bd ft in 1989. This is nearly one-third of North America's total output. But these firms are dominant in softwoods: while they account for 38% of the softwood lumber cut in Canada and the U.S., these companies produced only 4% of the hardwood.

The top 10 American sawmillers cut 13.66 billion bd ft, or 28% of the nation's total. In Canada, the 10 leaders were even more dominant: their 10 billion bd ft accounted for 40% of the national total.

To order your copy of the latest issue of the *North American Factbook*, see p. 86. ■

G-P rejects employees' stock-buyout scheme

Georgia-Pacific Corp. officials may have had a good time taking over Great Northern Nekoosa Corp., but they're not interested in having the same thing happen to them.

G-P "refuses to take seriously" a proposal that its 60,000 employees take over the company by buying its stock. The biggest employee stock ownership program ever proposed in the U.S. could cost $10 billion.

International Business Consultants of Dallas, Texas, representing a small group of people from Texas and Arkansas, is leading the proposal to get G-P employees to buy the Atlanta-based company. With its acquisition of Great Northern this year, Georgia-Pacific became North America's largest forest products company.

G-P chairman and chief executive officer T. Marshall Hahn Jr. called IBC's scheme "misleading or manipulative." G-P "does not take seriously the possibility that . . .IBC could effect the buyout using an employee stock ownership plan."

Hahn also warned employees that they are taking a risk by investing in the buyout plan. In a prepared statement, he said two Arkansas real estate brokers and a former GNN employee are behind the bid.

Other news of mergers in the forest products industry:

- Bohemia Inc. of Eugene, Ore., wants to sell its California operations, and is considering offering some or all of its Oregon mills for sale. Bohemia owns 35,000 acres of timberland in California, a medium-density fiberboard plant at Rocklin and sawmills at Lincoln and Grass Valley.
- Northwood Pulp and Timber Ltd. will buy Rustad Bros. & Co. of Prince George, B.C. Rustad runs two sawmills and a wood preserving plant in Prince George. Northwood is jointly owned by Mead Corp. and Noranda Forest Inc.
- Hanson Industries of New York City has completed its purchase of an 85% share of Cavenham Forest Industries. The purchase price was $1.11 billion; Hanson will acquire the remaining 15% in August 1991 for $189 million. Cavenham is the sixth-largest private owner of timberland, with 1.7 million acres in Oregon, Washington, Mississippi and Louisiana. Cavenham's three sawmills cut 390 million bd ft in 1989; it leases the two Joe N. Miles & Sons sawmills, which produced 150 million bd ft. ■

Scott starts 2nd mill to make chips for export

Scott Paper Co. has started up a second chip mill which will supply pulp chips to Japan. The new mill is at Alliance, Ala., 16 miles north of Birmingham. The $4.3-million mill was designed and is being manufactured and installed by Progress Industries.

Cooper Chip Mill (Alabama) will produce about 300,000 tons of chips a year on a one-shift basis. It is one of two mills that will supply Scott Paper's $10-million chip export facility in Mobile, Ala. Barges will move chips from Alliance to Mobile.

A similar mill started up Oct. 1 on the Tenn-Tom Waterway in Tishomingo County, Miss. Operated by Shuqulak Lumber Co., it will also ship chips by water to Mobile. Price Industries built the Shuqulak mill.

Scott's port in Mobile opened last April with a capacity to handle 1.7 million tons of chips a year. ■

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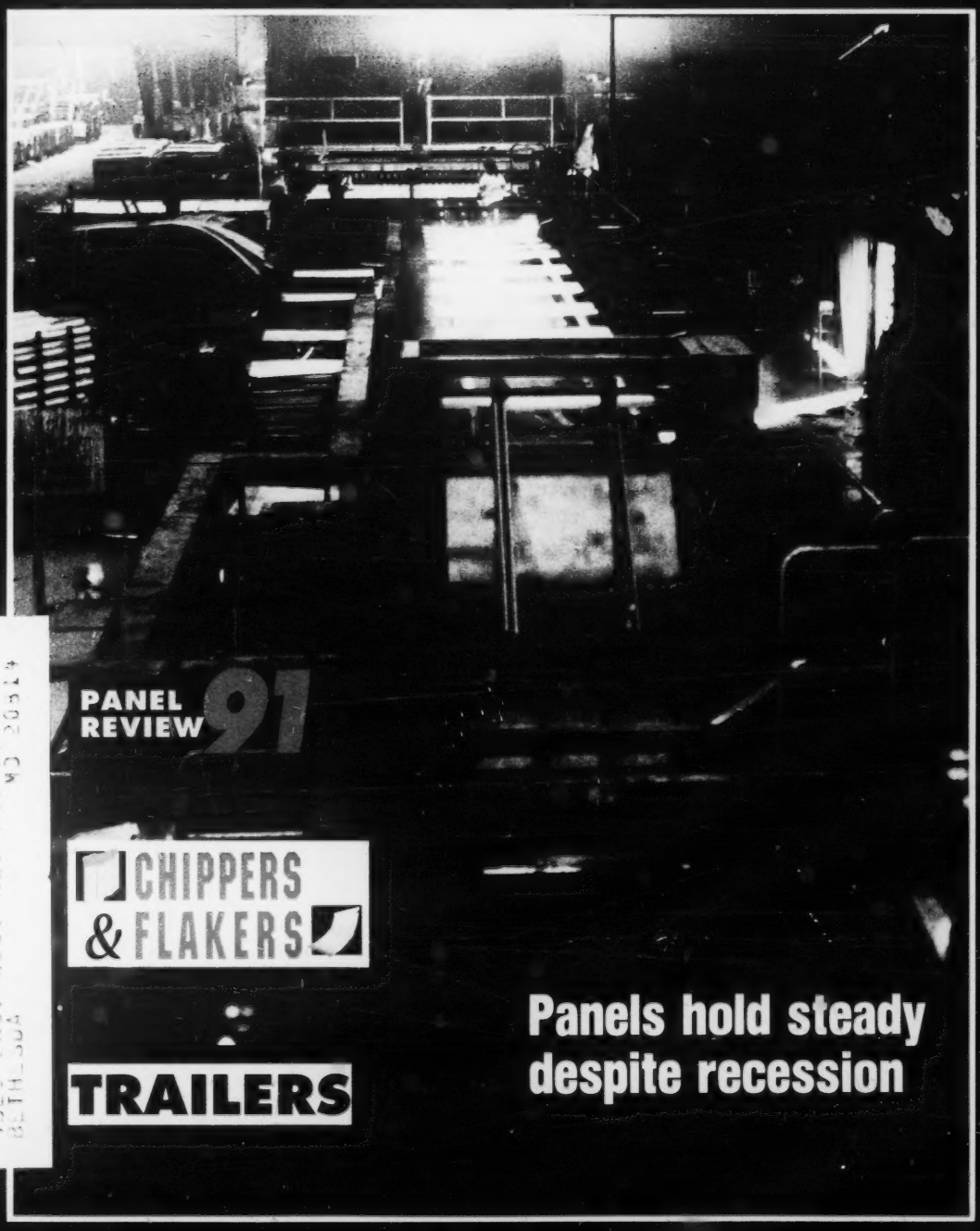

PANEL REVIEW 91

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Panels hold steady despite recession

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15 **European MDF capacity grows with new plants** Much of European technology and many of the suppliers are also represented among fiberboard plants in North America. Process automation, integrated controls are typical

20 **Indian firm seeks spot in laminated panel market** GVK America Inc., Biscoe, N.C., has targeted a niche in the U.S. market for low-pressure melamine-faced particleboard

22 **B.C. forest industry fights 'green' attacks** Environmentalists have twisted facts to support emotional attacks on industry which is now presenting its case to the public

26 **'Back to basics' approach appeals to low-country logger** Upchurch Inc., a Walterboro, S.C., timber harvester and processor, has adopted manual felling, an unusual return to basics in mechanized harvesting country

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37 **Product Review: Chippers and Flakers** Quality output can be achieved whether converting mill residuals to pulp chips or flaking roundwood for board products. Here's a sample of recent developments in the field

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VOLUME 118 NUMBER 3

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Panel output slips in poor market year

Despite lousy housing starts and preservationist victories, panel producers ended 1990 on a moderately successful note

Relatively speaking, wood-based panel producers in the United States fared okay in a year marked by preservationist pressures, general economic doldrums and a weak housing market. Production and shipments were down slightly in all major categories, but not so much as one would expect. Figures in the table below trace performance over the decade. In summary:

- Structural panels (softwood plywood, oriented strand board, waferboard and oriented waferboard) edged downward for the second consecutive year after production peaked in 1988 at 27.2 billion ft² (⅜-in. basis). Output slipped 2.6% from that level but settled only another 0.6% in 1990 to 26.3 billion ft².
- Particleboard shipments eased off last year's record by 2.5% to an estimated 3.76 billion ft² (¾-in. basis).
- Medium-density fiberboard shipments, which had been moving upward annually since 1983, dropped 4.1% to reverse the trend.
- Hardboard shipments decreased 3.3% to 5.0 billion ft² (⅛-in. basis).

Structural panels

The American Plywood Assn. predicts structural panel production will slide another 5% this year to 25 billion ft², based on the association's estimate of housing starts at 1,073,000 units. The trend should reverse in 1992, however, when structural panel production is projected at 26.6 billion ft² and housing starts at 1.25 million units.

In presenting this forecast to APA directors, general manager Bruce E. Lyons noted that APA's estimates of housing starts is conservative in comparison with some others: National Assn. of Home Builders has forecast 1.15 million for 1991, while Resource Information Systems Inc. has estimated 1.260 million units will be started in 1991 and another 1.6 million in 1992.

APA members in the West have borne the brunt of preservationist efforts to place old-growth timber, spotted owl habitat and other selected stands off limits to logging. This factor, combined with depressed markets overall, has taken its toll: the association estimated in late February that 46% of U.S. panel mills operating in 1990 had either shut down permanently, were temporarily closed or had curtailed production.

"The association's strategy in the coming months will be to maintain promotional thrust in all areas of the marketplace where opportunities exist to increase demand. At the same time, we are following the long-standing APA practice of adjusting our programs and operations to the

U.S. panel production, 1980-1990 (thousand ft²)

Year	Structural panels (⅜-in. basis)	Particleboard[1] (¾-in. basis)	MDF[1] (¾-in. basis)	Hardboard[1] (⅛-in. basis)
1980	18,468,000	2,949,587	493,140	8,140,000
1981	17,023,000	2,669,352	516,102	6,104,000
1982	16,402,554	2,393,086	446,157	5,586,918
1983	20,821,342	3,009,343	604,323	7,302,702
1984	21,967,917	3,195,586	633,974	6,837,118
1985	22,838,170	3,330,517	684,593	6,300,146
1986	25,632,830	3,602,757	780,598	5,822,326
1987	27,001,000	3,705,560	899,282	5,457,508
1988	27,202,822	3,829,021	938,717	5,117,857
1989	26,490,320	3,858,226	970,001	5,195,651
1990	26,337,186	3,760,000[2]	930,000[2]	5,026,326

[1] Shipments. [2] Estimated. SOURCES: American Plywood Assn., National Particleboard Assn., Association of Hardboard Assn.

realities of supply and demand," said president William T. Robison.

APA is maintaining its aggressive export market development program, with offices in five overseas cities. Gregory Forest Products Inc. of Glendale, Ore., in December 1990 became the first APA member company with authority to apply the Japan Agricultural Standard (JAS) stamp in its own plant under the Foreign Testing Organization certification granted APA IN 1989.

Draft standards for a harmonized performance standard for U.S. and Canadian plywood sheathing were approved recently by the Canada-U.S. Binational Committee on Plywood Standards. While many steps remain to be taken down the trail to harmonization, this action was viewed as a major milestone.

Particleboard and MDF

National Particleboard Assn. has released its 1991 annual capacity survey, which tabulates annual U.S. particleboard capacity at 4.677 billion ft² and MDF capacity at 1.047 billion ft² (both ¾-in. basis). Both figures are up slightly from the 1990 survey.

MDF capacity will increase this year by 100 million ft² upon completion of the Willamette Industries plant in Bennettsville, S.C. No changes in particleboard capacity are forecast by NPA for 1991.

Two particleboard and two MDF plants are forecast for completion beyond 1991:

- Mill's Pride Inc., Waverly, Ohio, particleboard, 68 million ft², 1993.
- Masonite Corp., Waverly, Va., particleboard, 100 million ft², 1994.
- Paris Fiber Inc., Paris, Tenn., MDF, 90 million ft², 1992.
- Reincorp International Inc., Washington County, Ala., MDF, 100 million ft², 1993.

The Particleboard/MDF institute continues to grow in membership and expand its programs. The institute now has over 60 members committed to promoting increased use of products containing particleboard and MDF.

The institute's promotional programs in 1991 will be directed toward education of furniture sales staff at the retail level. Educational materials are being developed and the institute is working closely with the National Home Furnishings Assn.

Hardboard

Basic hardboard and siding shipments last year were both down 3% from 1989, according to the American Hardboard Assn. The industry expects total shipments in 1991 to decline slightly ahead of an upturn in the second half. Estimates are based on housing starts of around one million units.

Even though housing will continue to be a soft market, the association is positioning itself for the future, noted executive vice president C. Curtis Peterson. Coinciding with an increase in the use of hardboard siding in the custom home market, AHA has incorporated a "hardboard home of the year" contest for builders into its promotion program. Winners will be announced in May.

The association is also using this period to expand basic research into panel properties and incorporation of post-consumer newsprint into industry products. ■

Canadian production also down slightly

Wood-based panel production from Canadian mills declined in the neighborhood of 9% to 10% last year in comparison with the year before. As the table shows, production of construction plywood declined 8.9%, particleboard production slipped 10.4%, and output of waferboard and OSB combined softened by 9.0%. Figures were supplied by Statistics Canada.

Waferboard/OSB production had been climbing steadily up through last year, when it breached the 2 million-m³ level before settling down to 1.966 million m³ in 1990. Construction plywood and particleboard have failed annually to eclipse record production levels set in 1987.

The British Columbia plywood industry reported a drop in both production and shipments in 1990. Member mills of the Council of Forest Industries of B.C., which account for approximately 70% of all Canadian softwood plywood, produced 1.6 billion ft² (⅜-in. basis) in 1990, a 10% drop from 1989.

Canadian panel production, 1984-90 (m³)

Year	Const. plywood	Particleboard	Waferboard/OSB
1990	1,971,541	1,146,018	1,965,827
1989	2,165,356	1,279,414	2,159,961
1988	2,161,658	1,213,364	1,646,663
1987	2,229,000	1,355,107	1,607,171
1986	1,876,896	1,139,253	1,347,638
1985	1,957,887	1,047,500	1,336,566
1984	1,846,369	843,346	1,190,254

SOURCE: Statistics Canada

Domestic and export shipments shared in the decline. Exports in 1990 accounted for 284 million ft², down 12% from 1989, while domestic shipments were 1.298 billion ft², down 11%.

"Our industry has been hit hard on many fronts," said Peter Metcalfe, COFI's plywood marketing manager. "We've been feeling the impact from the deepening recession in Canada, high interest rates, the high Canadian dollar, increased competition from other panel products and the cost crunch resulting from higher stumpage rates.

He indicated bright spots on the horizon: "Interest rates are starting to drop and that, combined with a projected increase in Canadian immigration, should help stimulate the Canadian housing market, which is the main plywood customer."

Excellent growth potential is seen in the Japanese market, where exports in 1990 were up by 32% over 1989. The COFI Plywood Technical Center in 1990 completed registration of all member plywood mills seeking JAS certification.

The technical center last year developed a new panel edge profile, to be available in the spring of 1991. It is considered an improvement over the standard tongue-and-groove profile, particularly in floor construction. ■

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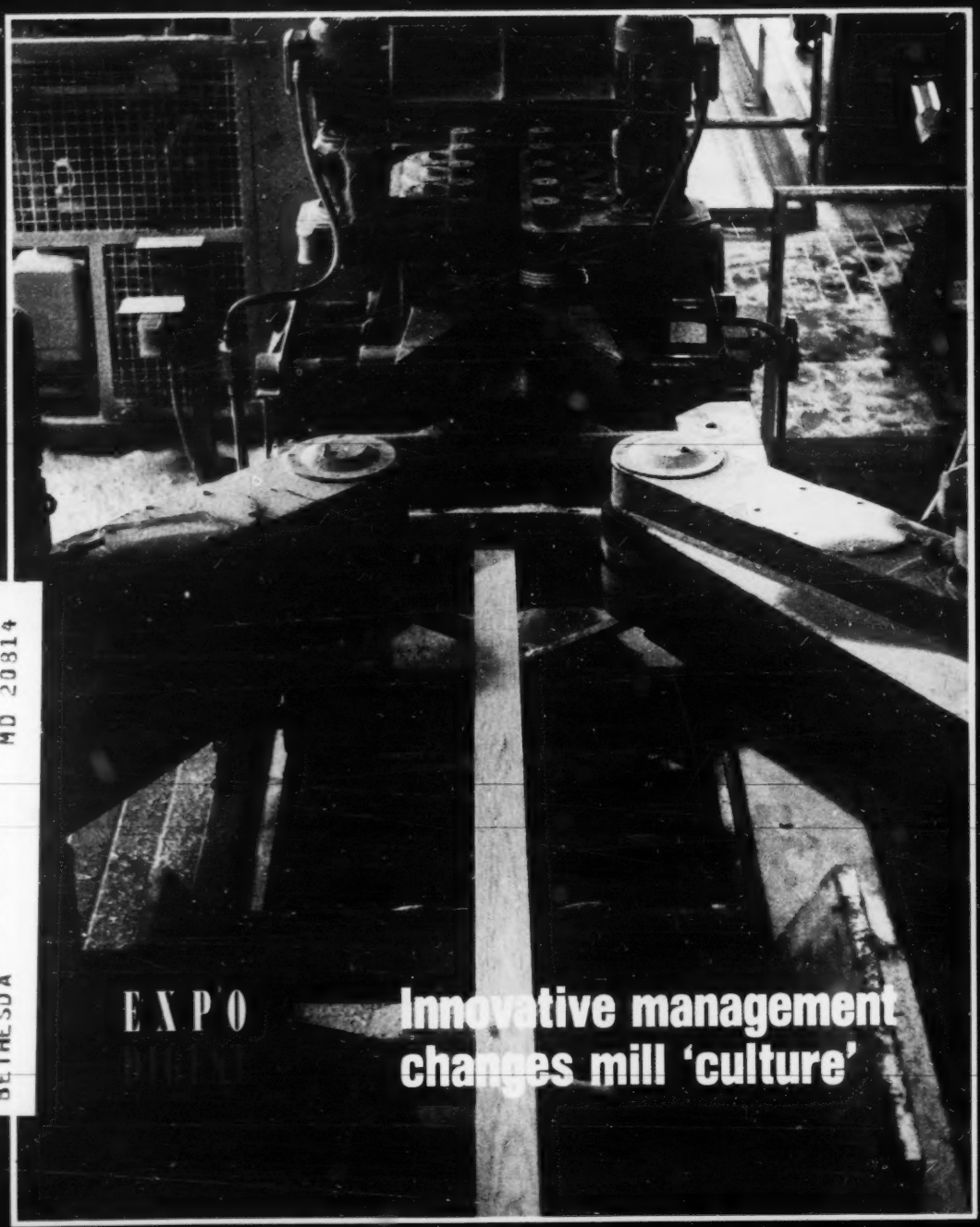

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'Ignorance' of logging costs harms long-term forestry

Current and future profits, forest health depend on knowing the real costs of timber harvesting and transportation

BY DENNIS P. BRADLEY

Our ignorance about the costs of harvesting and transporting logs is profound, despite the fact that they may amount to more than half of all the timber management costs incurred over a rotation.

Because we know so little about harvest and transport costs, few land managers regularly consider how their choices will affect profit or loss far into the future. Unless revenues over a rotation regularly offset all costs, unless regeneration succeeds and unless long-term productivity is protected, timber management may not be an option in many areas. And financial performance may turn out to be the *least important* impact of harvest system development and deployment.

If environmental damage results from poor choices, some forest management may be banned, perhaps unfairly or unnecessarily. Worse, we may be unable to reverse earlier environmental damage.

Four questions must be considered:

- Why do we neglect harvest-transport research?
- How does the Forest Service project harvest and transport technology and costs for the 1989 Resources Planning Act (RPA) Assessment?
- How do technological projections and changing forest conditions interact to determine specific costs used in the 1989 RPA assessment?
- What are the potential impacts of harvest research on costs and environmental protection?

One likely conclusion: the East will play a larger role in filling the nation's woodbasket.

Why do we neglect research?

If harvesting and transport have such profound impacts on ecological, economic and social results, why do we neglect them? Understanding the structure of the forest industry sheds some light on this question.

At the foundation are millions of forest landowners, public and private. Most are unorganized; with the exception of a few large owners, most are "price takers." They rarely cut their own timber. Most are unaware of ways to reduce costs or use timber better. As a result, returns to these owners have been considered a "residual"—the money left after logging and trucking costs have been subtracted from the mill's FOB log price.

For most landowners, the proposition is "take it or leave it." By contrast, farmers are extremely well-informed about technology's effect on their success. Imagine a farmer's reaction to seeing his corn picker leave every other ear to rot in the field.

Next on the ladder are thousands of logging firms. Most are small, independent contractors with little or no ties to other loggers, landowners or mills. So they are also "price takers," with few long-term incentives to be efficient. They pass their costs on to timber owners willing to sell at the time, reducing the owners' "residual."

Loggers' resourcefulness is legendary: much new technology still originates among these small operators. But since most harvesting innovations are easily copied, exclusive advantages are short-lived. So where do the benefits of new technology go?

Generally, they end up in the much smaller number of mills sitting at the top of the industry ladder. Although mill competitiveness varies widely by region and product, mills have some control over wood prices. They are "price setters," at least for the logger and landowner.

Thus, benefits from increased harvest and transport productivity generally accrue to mills, not to loggers or landowners. Indeed, competition among loggers and landowners tends to force down both log prices and stumpage. It takes market power and financial strength to reap the benefits of harvest research. Only mills and a few large landowners have this clout.

Ironically, most logging and much harvesting research were once done by the forest industry's own employees on company lands. Today, this is rare. What happened? A major cause is surely the widespread land sell-off over the last few decades. Companies sold land partly because of what some call an obsessive interest in short-term profit; others sold to thwart a hostile takeover based on undervalued timberland assets.

Few forest industry firms still own significant timber-

land, so they no longer bear the opportunity costs of inefficient or damaging harvests. But every landowner does bear these costs—especially the U.S. Forest Service and other land management agencies. With Forest Service annual timber sales of about $1.5 billion, costs only 10% too high (or utilization 10% too low) would cost the taxpayers $150 million a year. This is a modest estimate, and does not include other losses or environmental damage that are surely occurring.

The fact is, today's harvest systems are socially and economically inefficient. Costs are too high. Too much wood is wasted. Future forest productivity is frequently jeopardized. We are not moving fast enough, or across a broad-enough front, on these harvesting and transport problems.

Indeed, harvest research, carried out fitfully by a small number of companies, universities and federal laboratories, is having an increasingly difficult time getting funding. A Louisiana-Pacific Corp. ad several years ago aptly suggested that if we harvested food as inefficiently as wood, apples would cost $5 apiece.

The short and long-term implications of this are serious. First, because all forests are mixtures of sites with low to high productivity and species with various properties and uses, inefficiency forces us to commit a larger total area to forest management than we would need with better methods.

Second, mills which must forage farther afield to meet their needs pay higher transport costs for wood. Third, landowners lose when their lands are unnecessarily considered unproductive or inaccessible. Fourth, lands damaged by improper techniques may not yield future revenues or benefits.

Fifth, these inefficiencies combine to increase conflicts with other forest users. For example, it might be possible to avoid cutting irreplaceable old-growth stands. And finally, all of these factors may lead public and private landowners to be less willing to invest today in forest management.

But harvest and transport systems can be more efficient. We can learn to improve productivity and protect other values—just as Scandinavians do.

Unless we do both—improve technology and coordinate management and harvest plans better—public and private landowners will be disappointed by the market outcome. This will put future productivity and other forest values at risk and reduce future timber supplies. Indeed, the "below-cost" timber sale issue, based on real or perceived failures to manage existing stands economically, is due in part to this neglect and has already reduced tomorrow's timber investments.

TABLE 1—Proportions of harvest systems used in 1985 by region, with projections to 2040

		Projections (%)				
Section and region	**1985**	**2000**	**2010**	**2020**	**2030**	**2040**
East—flat terrain						
South—Cable skidding	35.0	30.0	25.0	20.0	15.0	10.0
Grapple skidding	43.0	47.0	51.0	55.0	59.0	63.0
Bobtail trucks and farm tractors	17.0	16.0	15.0	14.0	13.0	12.0
Whole-tree chipping	5.0	7.0	9.0	11.0	13.0	15.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
North—cable skidding	61.0	50.0	40.0	31.0	22.0	14.0
Grapple skidding	26.0	29.0	33.0	36.0	39.0	41.0
Forwarders	5.0	9.0	13.0	17.0	20.0	24.0
Whole-tree chipping	9.0	11.0	14.0	16.0	19.0	21.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
East—mountainous terrain (systems used in both North and South)						
Cable yarding	10.0	16.0	22.0	28.0	34.0	40.0
Skidding and forwarding	90.0	84.0	78.0	72.0	66.0	60.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
West—Douglas fir subregion						
Highlead	20.0	18.0	16.0	14.0	12.0	10.0
Skyline—short	37.5	38.0	38.5	39.0	39.5	40.0
—medium	7.5	8.0	8.5	9.0	9.5	10.0
—long	2.5	2.6	2.7	2.8	2.9	3.0
Tractors	32.5	33.4	34.3	35.2	36.1	37.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
West—Ponderosa pine subregion						
Highlead	3.0	3.4	3.8	4.2	4.6	5.0
Skyline—short	12.0	12.6	13.2	13.8	14.4	15.0
—medium	6.0	6.4	6.8	7.2	7.6	8.0
—long	0.0	0.4	0.8	1.2	1.6	2.0
Tractors	79.0	77.2	75.4	73.6	71.8	70.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
West—Pacific Southwest subregion						
Highlead	6.4	6.1	5.8	5.6	5.3	5.0
Skyline—short	23.2	24.0	24.8	25.4	26.2	27.0
—medium	7.4	8.3	9.2	10.2	11.1	12.0
—long	0.0	0.2	0.4	0.6	0.8	1.0
Tractors	63.0	61.4	59.8	58.2	56.6	55.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Rocky Mountain subregion						
Tractors and jammers	86.1	83.9	81.7	79.5	77.2	75.0
Cable yarding	13.9	16.1	18.3	20.5	22.8	25.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Projecting technology and costs

Over the next 50 years, we expect increasing use of more efficient and more productive harvest and transport systems. And each of the surviving systems will become more efficient. Both effects are estimated in the following cost-projection effort.

To start, the Forest Service's five harvesting research projects identified each region's major harvest systems and costs. Actual logging systems vary more than indicat-

ed, but these system mixes capture the essence of regional conditions. Average tree diameter and volume per acre indicate relative costs.

Generally, the cost rank, from lowest to highest, is South, North, Rocky Mountain, East Mountainous, Ponderosa pine subregion, then a tie for costliest between Douglas fir and Pacific Southwest subregions.

Substantial shifts in system mix are expected in each region over the next 50 years (Table 1). On flat land in the East, loggers will rely increasingly on mechanized felling, bunching and grapple skidding to central landings for processing and loading. Feller-bunchers with shears are replacing chain saw felling in pulpwood operations, but saws will be used on some sawlog and veneer operations to prevent valuable butt logs from splitting. More feller-bunchers will be teamed with split-reducing cutting heads.

Grapple skidders will replace most cable skidders by 2040 because they are faster and safer. Their share will rise from 43% to 63% in the South, and 5% to 24% in the North. The South's labor-intensive bobtail truck and farm tractor systems will decline slightly by 2040, from 17% to 12% of roundwood output.

In the North, forwarders are predicted to expand from 25% to 40% of output by 2040. Whole-tree chipping is expected to increase modestly, from 5% to 15% in the South and 9% to 21% in the North.

The East has many "mountainous" forests. While not as rugged as western terrain, eastern mountains are near a large and concerned population, have highly erodible soils and generally less-productive sites. These factors heighten the need for cost-effective, environmentally sound harvesting equipment and methods.

Several small cable yarding systems, adapted from European and West Coast machines, have been used successfully in the East. By 2040, these systems will increase their share of roundwood output from 10% to 40%.

The Pacific Coast's rugged terrain and extremely large trees often require expensive cable yarding systems. Skyline systems are forecast to gradually replace high-lead rigs. Skyline running gear is more complex and versatile, though both systems use mobile steel towers. Large trees and steep slopes make hand-felling a must.

Ground skidding will continue at current levels in all Pacific regions: from only 33% in the Douglas fir region to 75% in the Ponderosa pine area.

In the Rockies, ground skidding accounts for almost half of logging; jammer systems are used for about 37% of the harvest. Smaller cable yarders adapted from West Coast machines will supplant these systems, moving up from about 14% of the harvest now to 25% by 2040. Loggers will shift to more productive systems which require less labor.

Boosting logging productivity

The second change considered is increased productivity of logging systems. Regardless of technical change, most experts believe that future logging systems will look much like current ones. Tomorrow's logging machines will still have to move over rough surfaces, sever and handle heavy trees or logs and carry them considerable distances in all kinds of weather.

The task for machine and system designers will be to improve in six areas: load capacity, travel and processing speed, reliability and durability, species and product versatility, terrain capability and operator comfort and safety. But optimum machine design is rarely a useful guideline. Maximizing *productivity* may be appropriate in a controlled factory environment, but *versatility* is often more important in the woods.

But researchers agree that significant opportunities for improvements exist. The size of these improvements and the speed with which they are adopted will depend in large part on research investment. Specific changes now in progress or being contemplated for feller-bunchers, skidders, forwarders, processing, loading and trucking will be stimulated by these problems:

- Steep and wet terrain.
- Stands with significant amounts of multiple products or currently unmerchantable stands.
- Low-density stands, or those with many small trees.
- Small harvest tracts as required by law or due to fragmented ownerships.
- Increasingly expensive road construction and hauling costs.
- Need to recover branches, tops, bark and other previously unmerchantable material.
- Need to protect long-term forest productivity.
- Worker health and safety.

Major cost-saving opportunities exist in felling, bunching, ground skidding, cable yarding and log transport. These jobs are the most capital and energy-intensive, and are the most dangerous. Fuel-efficient, light-

TABLE 2—Trends in harvested tree diameter and volume per acre by region, 1985 to 2040[1]

		Diameter and volume projections for:				
Section and region	1985	2000	2010	2020	2030	2040
South						
Tree diameter (in.)	13.1	13.1	12.9	12.6	12.4	12.2
Volume/acre (mbf)	7.4	9.0	9.6	9.8	9.8	9.7
North						
Tree diameter (in.)	11.3	11.2	11.3	11.3	11.4	11.5
Volume/acre (mbf)	7.5	9.2	10.0	10.5	10.7	10.9
West—Douglas fir subregion						
Tree diameter (in.)	24.9	20.0	18.2	16.3	14.5	12.7
Volume/acre (mbf)	26.5	26.0	26.0	26.1	26.3	26.5
Ponderosa Pine subregion						
Tree diameter (in.)	16.1	14.8	13.9	13.2	12.5	11.8
Volume/acre (mbf)	12.5	12.2	12.2	12.3	12.4	12.5
Pacific Southwest subregion						
Tree diameter (in.)	24.9	20.0	18.2	16.3	14.5	12.7
Volume/acre (mbf)	18.3	15.9	15.9	16.0	16.2	16.3
Rocky Mountain						
Tree diameter (in.)	16.1	14.8	13.9	13.2	12.5	11.8
Volume/acre (mbf)	11.9	13.1	13.8	14.4	14.8	15.0

[1] *Diameter trends consider softwoods only. Volume per acre trends consider both softwoods and hardwoods.*

er machines and engines should cut energy costs significantly.

Using them will allow longer economical skidding or yarding distances, so fewer roads will be necessary—further reducing both costs and environmental impacts. Depending on machine, function and region, the next 50 years will bring modest improvements in productivity. Estimates for individual machines ranged from 11% to 42%. Overall system improvements will be much lower.

Improving safety and ergonomic design is very important and could have very large impacts. Our current inattention to worker health and safety continues to raise costs. A continuing poor safety record, despite substantial safety efforts, mean a logging worker's compensation costs frequently equal direct payroll expenses.

There is no good reason why improved machine design and safety practices, following proven European experience, would not cut costs and suffering dramatically.

Smaller trees, lower volumes

Average tree diameter and volume per acre must also be considered when projecting future logging costs (Table 2). To compute average harvesting costs for each region, these factors were combined with individual systems' cost, the projected share of wood harvested by each system (Table 1) and expected rates of productivity improvement over the next 50 years. Assumptions about diameter and volume per acre are based on regional inventory and removal models. These probably have the largest effect on harvest cost projections.

Except in the Pacific Northwest, the forecast is for logging costs to increase at a slower rate during the next 50 years than from 1952 to 1985. But everywhere, costs will rise substantially.

Pacific Coast logging costs rise the most because of projected 40% declines in stand diameter between 1985 and 2040. The cost increases are expected to range between 43% (Douglas fir region) and 64% (Ponderosa pine region).

By contrast, a projected 25% decline in average stand diameter in the Rocky Mountains would be offset by increasing volume per acre. Logging costs will rise there 26%. In the South, stand diameter is projected to decline only slightly while stand volume rises 20%, for a minimal 1% cost increase. Logging costs in the Northeast probably will not change much, while North Central region loggers could see their costs fall about 6%.

Savings generated on road system design and construction affect both timber management and all other uses over the life of the road. Where new methods can recover more timber with fewer, smaller, shorter-lived roads, negative soil and water impacts are reduced.

An example is development of Central Tire Inflation Systems (CTIS) for logging trucks. CTIS allows truckers to raise or lower all tire pressures quickly, easily and simultaneously. Low tire pressures cause less damage to forest roads; highway travel requires higher pressures.

Harvest and transport research goes beyond reducing direct costs to focus on protecting environmental values during logging. These efforts may actually raise direct costs to protect long-term forest productivity.

Harvest research could also reduce risk and uncertainty when considering future investments: will owners and managers be allowed to cut the timber from stands now being planted? This benefit is difficult, perhaps impossible, to measure. So is another indirect benefit of more efficient and versatile logging systems: reduction in woodyard inventories and their associated carrying costs.

Harvesting technology has gradually improved; there is every reason to expect continued improvement. These social and economic forces may speed progress: making timber management pay its own way, growing concern for adequate wood supplies and concern about logging's long-term effects on forest productivity.

Despite these real needs and opportunities, harvest research budgets have declined in real terms over the past 20 years. Several things might change this.

First, land managers must recognize that today's decisions can reduce future logging costs. They must focus on more productive, accessible sites, emphasize silvicultural treatments that produce larger diameters instead of mere biomass and, where necessary, provide financial incentives to use less-used species and components.

Previous RPA assessments focused on more-intensive forest management as the best way to enhance future timber supplies, with little mention of harvesting and utilization opportunities. Current efforts to provide more objective comparisons could make a great difference to future programs.

Second, small loggers should try to operate closer to capacity, focus on employee training for production and safety, engage competent financial and management expertise and, especially, mount much more aggressive development and lobbying efforts.

Third, major timberland owners, agencies and forest industries must recognize their immense stake in developing productive and socially efficient harvest systems. Successful forestry investment depends on expanding support for formal, well-funded harvesting research in all major species and terrain types. It is likely that no such important ecological and industrial activity in the U.S. economy spends so little on research and development.

Finally, if predicted regional changes in stand diameter and volume per acre occur, cost alone will cause major regional shifts in timber management and timber sales. These will occur regardless of what happens to harvest and transport technology.

Even under the most optimistic forecasts of technical change, projected declines in tree diameters will cause large relative cost increases in the West. Couple these cost increases with other likely environmental restrictions on western forests and the implications are more dramatic.

These problems in the West, combined with recent evidence of significant timber surpluses in the East and emphasis on hardwood management and utilization, suggest an eastward shift in the comparative advantage of timber production in the United States. ■

THE AUTHOR is an economist at the U.S. Forest Service North Central Forest Experiment Station in St. Paul, Minn. The following Forest Service scientists have contributed data and other assistance: William Lange, Madison, Wis.; Charles Mann, Robert McGaughey and Michael Gonsior, Seattle, Wash.; Penn Peters, Morgantown, W.Va.; Donald Sirois and Bryce Stokes, Auburn, Ala.; and Michael Thompson, Houghton, Mich.

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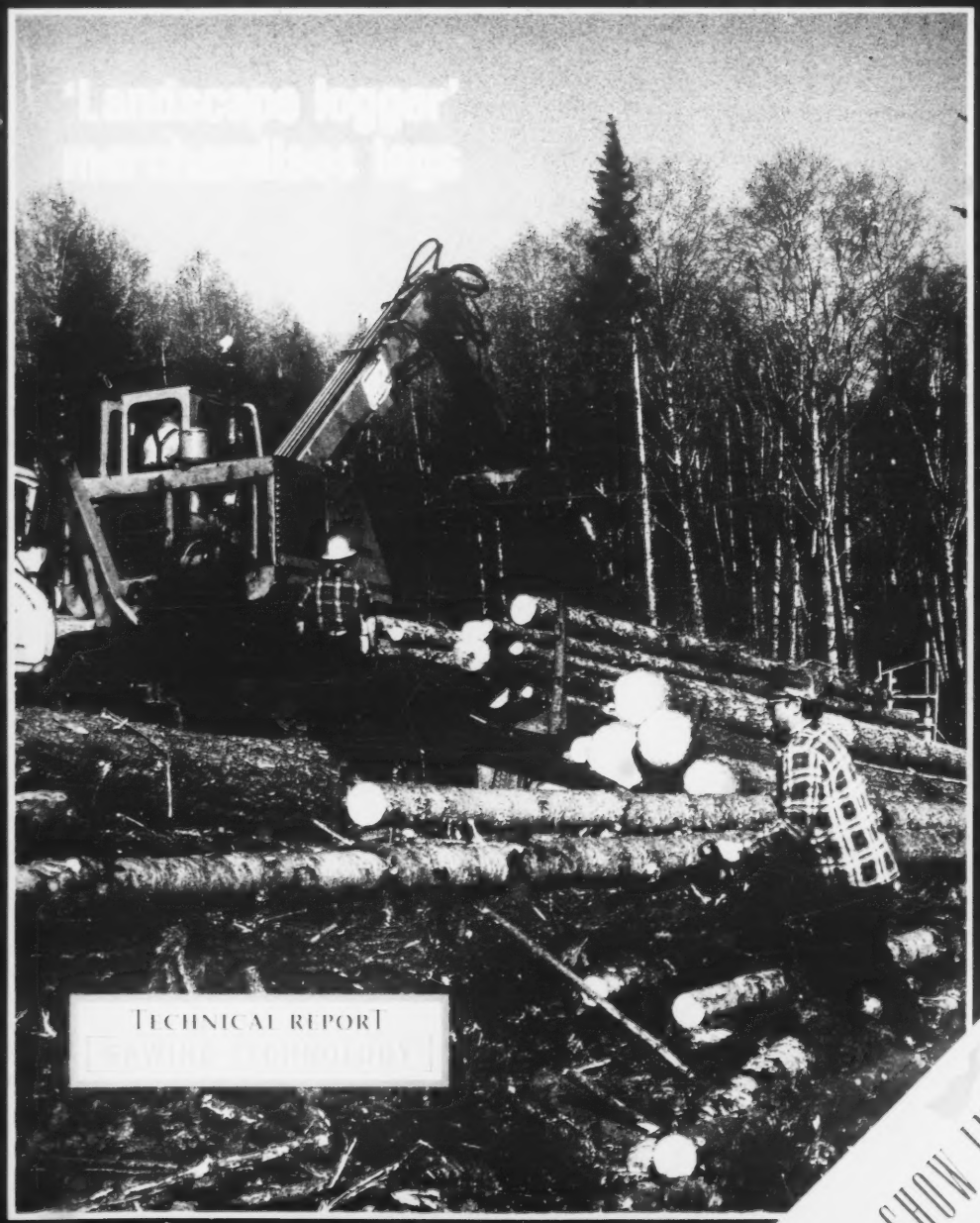

TECHNICAL REPORT

SHOW IN PRINT

SEPT 1991

FOREST INDUSTRIES

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5 Bickering over logging continues in courts, Congress From the halls of Washington to the shores of the Pacific, friends and foes of logging bickered throughout the summer over which endangered species most merit saving

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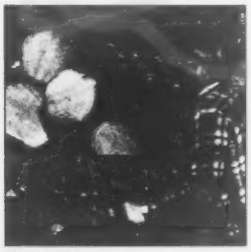

Washington *logger understands how to merchandise logs.* *See Page 12.*

TECHNICAL REPORT
SAWING TECHNOLOGY

SHOW IN PRINT

12 Logger's success depends on knowing products, markets Tom Swarts of Northwest Timber Services Inc., Washougal, Wash., attributes his success to understanding how to merchandise logs. For top log value, know what to make and where to sell it

15 Choosing the best primary breakdown saw A sawmill earns its keep by cutting logs into lumber efficiently. The best place to boost efficiency is at the headrig saw

18 Can small mills profit from thin-kerf gangs? Yes, according to a study of top-arbor, narrow-kerf gangs operating at seven North Carolina sawmills. But care must be exercised

22 Fast, efficient hardwood mill pushes 'outer limits' back Tennessee producer may use the thinnest circle saws in North America for hardwood. Switching to cobalt-based alloy raised efficiency, lumber quality for Whitson Lumber

23 Saw Technology Buyers' Guide A special guide to suppliers of products and services for the operation and maintenance of sawing systems

26 FOREST INDUSTRIES' Show in Print This special presentation features products and services offered by advertisers in this issue, and provides an in-depth look at examples of current technology which are bringing new levels of productivity, efficiency and resource utilization to the industry

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Trus Joist, MacBlo form partnership

Two leading firms in engineered wood products, TJ International Inc. and MacMillan Bloedel Ltd., intend to form a joint-venture partnership to produce and sell such engineered products as joists, trusses and engineered structural lumber. The new company, Trus Joist Corp., will have headquarters in Boise, Idaho, where 51%-owner TJ International is located. TJI president Tom Denig will be president and CEO of the new firm.

MB, whose home is Vancouver, B.C., will own 49% of Trus Joist Corp. The two parents billed the joint venture as "the world's pre-eminent engineered wood products company."

Bob Findlay, MB's president and CEO, said the new venture will provide MB with an extensive manufacturing and marketing network for its patented engineered wood products. Parallam, an extruded laminated lumber, is already on the market. PSL 300, a new product made from oriented aspen strands, will go on sale after the first plant is finished later this year.

Parallam is manufactured in two plants, one in suburban Vancouver and one in Colbert, Ga. The PSL 300 plant in Deerwood, Minn., will supply window and door stock. MB will design future PSL 300 plants to make structural products.

TJ International is already widely known for its open-web trusses, wooden I-joists and Micro = Lam laminated veneer lumber. Micro = Lam is used as residential headers and beams, scaffold planking and flanges for I-joists.

The new company will have the largest manufacturing capacity in the engineered wood products industry. One of its newest products is the Performance Plus series of joists. Trus Joist says the Performance Plus joists use wood more efficiently than competing I-joists, can span longer distances and carry heavier loads. ■

NW mills close at record rate

This year could record the largest number of lumber and plywood mill closures in 10 years in the Pacific Northwest. By early August, 19 sawmills and seven panel plants had shut down in Oregon, Washington and Idaho, plus five mills in California.

According to consultant Paul F. Ehinger & Associates of Eugene, Ore., this is already more sawmill closures than in any year since 1980. Ehinger counts as closed any mill that shuts down for 60 days or longer.

As bad as the '80s were for the Northwest's timber industry, the '90s look even worse. Last year, 18 sawmills and 22 panel plants closed. Thirteen more mills took long-term shutdowns, but have since restarted.

Since 1980, 144 sawmills with a combined annual capacity of 4.8 billion bd ft have closed permanently in the three states. In addition, 82 panel plants have closed. Overlap in production of veneer and plywood make it impossible to calculate these mills' combined production. The 226 closed mills employed almost 21,000 people.

Oregon has taken the brunt of the closures, with 71 sawmills and 65 panel plants out of business since 1980. Washington recorded 54 sawmill and 15 panel plant shutdowns, while Idaho lost 19 sawmills and two panel plants. Ehinger's decade-long study did not include Northern California. He noted that 24 sawmills and one panel plant have closed in this region since 1987.

The outlook is far from encouraging, since federal timber supplies have nearly vanished. In coastal Oregon, Washington and California, mills have 3.53 billion bd ft of federal timber under contract, about one-third of the volume under contract in 1986. For 1992, the under-contract supply shrinks to only 910 million bd ft. ■

1991 first-half sales, earnings for U.S., Canadian companies ($ millions)

U.S. companies

Company	Sales	% change 1990/91	Earnings	% change 1990/91
Boise Cascade	1970.6	-6.9	5.1	-96.4
Champion Intl.	2343.0	-7.9	19.3	-85.5
Georgia-Pacific	5759.0	-6.8	405.0	-44.1
Intl. Paper	6200.0	-3.1	236.0	-35.3
IP Timberlands	112.0	15.5	67.0	24.1
Louisiana-Pacific	847.4	-13.2	20.6	-72.1
Pope & Talbot	262.8	-10.2	3.9	-80.1
Potlatch	610.2	-6.0	21.4	-69.2
Temple-Inland	1225.2	3.9	82.7	-35.3
Weyerhaeuser	4400.0	-6.4	122.0	-50.0
Willamette Inds	956.0	-0.6	17.0	-80.2
WTD Industries'	243.9	-47.0	-85.2	N.M.

Canadian companies (C$)

Canfor Corp.	427.6	-10.2	-26.4	N.M.
Crestbrook	79.9	-32.6	-5.8	N.M.
Domtar	918.0	-24.7	-65.0	N.M.
Doman Inds	265.3	-14.4	-20.5	N.M.
Fletcher Challenge	536.0	-7.7	-27.2	N.M.
International FP	120.8	-28.4	-9.5	N.M.
MacMillan Bloedel	1405.5	-11.5	-7.5	N.M.
Malette	83.1	-28.0	-3.2	N.M.
Noranda Forest	2100.0	-12.5	-80.0	N.M.
Weldwood	352.7	0.7	-7.4	N.M.
West Fraser	252.8	-12.8	-8.2	N.M.

'Fiscal year ending April 30, 1991.
N.M. = Not meaningful.

***Oceans of red ink** poured from the books of many major forest products companies in both the United States and Canada for the first half of 1991. Despite earnings boosts from the short-lived spring rally in lumber and panel prices, generally low prices for solid-wood products, pulp and paper slashed earnings for U.S. companies by double-digit numbers. Canadians fared much worse, recording large losses. One survey of 16 major firms found a combined loss of C$223 million in the second quarter alone.*

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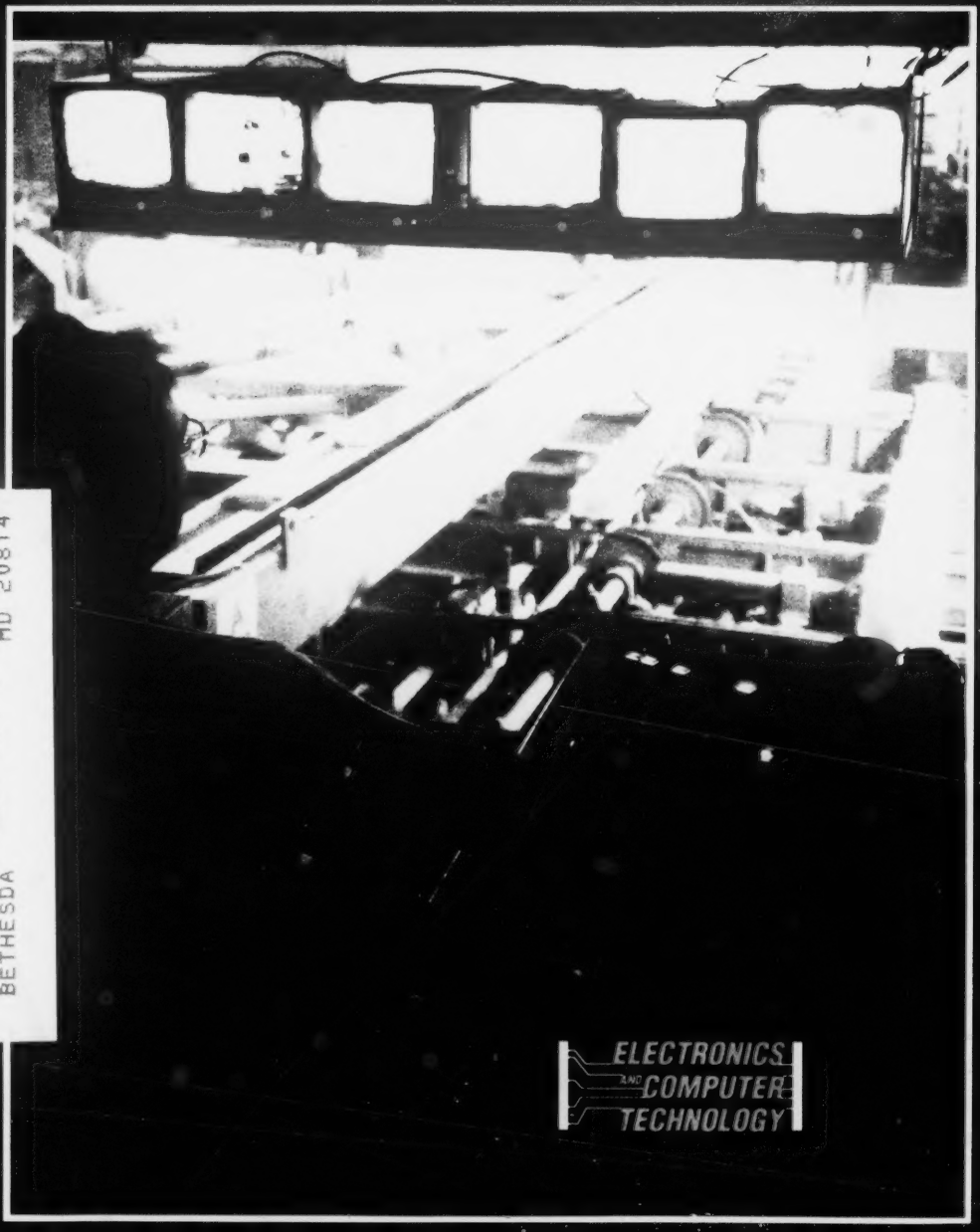

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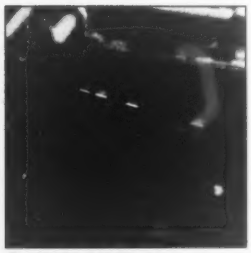
NEWS

5 Owl stew: industry bill faces a hard time in the House Recent events on the timber supply front produced considerable sound and fury, but time will judge their significance

8 Mill closures outlined as Bohemia sale nears Purchase of Bohemia Inc., Eugene, Ore., by Willamette Industries Inc., Portland, Ore., moved closer in late August when a definitive merger agreement was signed

FEATURES



Electronic *applications become more sophisticated.* *Review begins on p. 22.*

ELECTRONICS AND COMPUTER TECHNOLOGY

13 Log exports, in decline, can't offset land withdrawals It will take more than prohibition of log exports to offset timber lost through preservation victories

18 Recycling: not just for papers and bottles anymore Waste wood, like so many other 'disposables,' is increasingly seen as a valuable resource. Wood Exchange Inc., Portland, Ore., supplies hardboard mill's furnish

20 Computer model simulates supply, cost of chips IFCHIPSS model can figure out if wood is available to chip and how much it would cost to produce, haul the material

22 Improving visibility of laser guidelines Software helps calculate mounting geometry; optical focusing can increase intensity. The future: low-energy diodes, vivid colors

24 Electronic grading can produce many benefits As lumber producers seek diversified markets, grading flexibility becomes more essential. Computer teaches itself new rules

26 Technology update due at scanning conference Technical sessions, exhibition will define what's new in lumber, veneer and secondary products scanning at the 4th International Conference on Scanning Technology in the Wood Industry

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Log exports, in decline, can't offset land withdrawals

It will take more than prohibition of log exports to offset timber lost through preservation victories

BY BOB FLYNN

The United States has long been the world leader in exporting unprocessed softwood logs. Export volumes for logs reached a peak in 1988, but have been falling because of declining demand in some key markets.

This downward trend will continue due to a combination of factors: new U.S. legislation, changing patterns of log supply and changing market conditions.

Log exports from the U.S. in 1991-92 will drop 10% to 15% from 1990 levels due to new export restrictions and reduced log availability in Alaska. After that, log exports will slowly decline due to decreased supply from some U.S. sources, increased availability of other softwoods such as radiata pine from New Zealand, and greater demand in the market countries for processed wood.

While this decline may be good news for lumber producers in the Pacific Northwest, the volumes involved will come nowhere close to offsetting decreases in timber supply due to the spotted owl and other preservationst victories.

Lower volumes shipped

Almost 85% of all U.S. softwood log exports are shipped from Washington, Oregon and California. Alaska is the source of another 11% or 12%. The remaining small volumes are mostly from the Northeast, into Canada, and from the South.

In 1988, the West Coast exported 3.8 billion bd ft (Scribner) of softwood logs. This was the highest volume ever shipped, about 25% higher than in 1979. The volume from Pacific ports dropped about 10% in 1989 and another 10% in 1990, to approximately 3 billion bd ft.

(In January 1989, the Commerce Department began reporting export volumes in cubic meters. Resulting data contain more errors than normal due to confusion surrounding the change to metric measurement. Export statistics cited here for 1989 and 1990 are from private sources.)

Decreased log exports were not the result of any U.S. restrictions, but were purely market driven. Log shipments to China in 1989 and 1990 were less than half the volume shipped in 1988. For the first half of 1991, log exports from West Coast ports to Japan were down over 23% from 1990. Reduced demand will mask the effects of new log export restrictions, at least initially.

New U.S. legislation

Timber harvests from federal lands in the U.S. Pacific Northwest were going to decrease anyway, but the listing of the northern spotted owl as an endangered species has greatly accelerated this decline.

Timber harvests on federal lands in Washington, Oregon and California will decrease substantially. In September, Congress was considering options which balance economic considerations against preservation of old-growth stands, protection of spotted owls and marbeled murrelets, and consideration of habitat for sensitive fish species.

If the U.S. Fish and Wildlife Ser-

vice decides to implement its current critical habitat proposal, federal timber harvests in the owl region could fall by more than 75%. Estimates of the impact on timber harvesting range from a decrease of about 2 billion bd ft to almost 8 billion bd ft, depending on whether the owl conservation strategy is also applied to private lands.

Exporting unprocessed logs from public timberlands has long been the subject of a rancorous debate between sawmill owners and log exporters in the Pacific Northwest. Last year, Congress seized on the idea of restricting log exports to alleviate the timber shortage and resulting economic hardships caused by preservation efforts. In September, Congress passed the Federal Forest Resources Conservation and Shortage Relief Act of 1990. This act directly impacts log exports from federal and state forests and indirectly affects log exports from private lands.

Effects on federal timber

Before the act was passed, log exports from federal timberlands were prohibited by a rider to the annual Interior Department appropriations bill. The ban has been made permanent on all but a few minor "surplus" species such as Port Orford cedar.

In addition, the act tightens restrictions on the substitution of logs from federal lands for logs exported from private lands. Generally, firms which export logs from private lands cannot buy federal timber directly or indirectly, with a few exceptions. In some cases, firms may purchase federal timber within an approved "sourcing area" for their mills, even though they continue to export logs from private lands outside that sourcing area. Native American forestlands are exempt from this legislation.

Effects on state timber

The impacts of the new legislation vary by state. Alaska is not included in the act, so the main impact of this provision falls on Washington and Oregon.

Roughly 80 million to 100 million bd ft of logs from state-owned lands in Oregon have been exported annually for several years. The new act prohibits all log exports from state-owned lands and no substitution is allowed. If a firm exports timber from private lands anywhere in Oregon, it is no longer eligible to purchase any timber sales from the state.

In Washington, the state Department of Natural Resources sold more than 800 million bd ft annually during the 1980s, approximately 60% of which was exported. The new federal legislation requires that at least 75% of the annual sales volume be restricted to domestic processors.

Because not all logs on any given timber sale are of export quality, the actual reduction in export of logs from state and county-owned lands will be closer to 85%. Direct substitution is not allowed, but there is one exception: firms which export timber from western Washington may purchase DNR timber sales in the area east of the Columbia River for processing there. This exception affects mainly Plum Creek's mill in Spokane.

In Washington, indirect substitution is allowed on up to 33% of the restricted sales in 1991. (Up to one-third of the volume of restricted sales can be purchased by a qualified buyer and resold for domestic processing to someone who was not eligible to buy the sale in the first place.) This percentage declines to 20% in 1992 and 10% thereafter.

Effect on private timber

While the act will decrease the volume of public timber going into export markets, its effect on private lands is less clear. For example, in order to continue buying federal timber in Oregon, Weyerhaeuser has announced it will cease exporting timber from its own lands in that state.

This will not have much impact on the total available log supply, because about 90% of Weyerhaeuser's log exports come from its Washington tree farms. Logs that Weyerhaeuser might have exported from Oregon won't necessarily go to domestic mills; they might remain on the stump.

Finally, while some firms may choose to stop exporting in order to qualify to buy public timber, other companies and tree farm owners may increase their log exports, particularly if prices are forced higher by export restrictions.

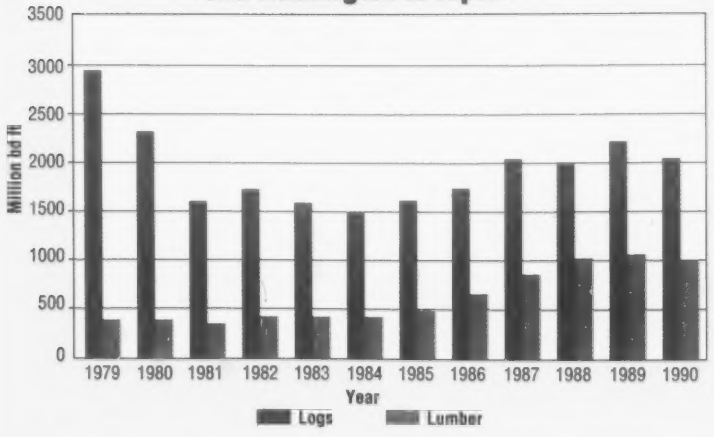
Net effects of export restrictions

The act's effects will be felt gradually over the next several years. While restrictions on state-owned timber in Washington went into effect Jan. 1, 1991, 900 million bd ft of timber sold earlier can be exported. These logs will enter the market over the next one to two years.

What will be the total impact of this new act? Possibly none at all. The Washington Board of Forestry has filed suit against the federal government claiming that restricting the sale of DNR timber violates the state constitution.

By state law, the department must manage state lands to produce maximum possible revenue for its trustees,

FIG. 1—Softwood log and lumber exports from Oregon and Washington to Japan



primarily state schools and universities. By not selling to log exporters, the department expects to lose between $60 and $100 million per year.

Even if the law is upheld, and even if there is an increase in volume from private lands, the new restrictions will prevent the export of no more than about 400 to 500 million bd ft of logs from public lands.

Changing supply patterns

Regardless of the effects of last year's legislation, log exports from the Pacific Northwest will decline because of changing supply patterns. For example, the supply of exportable timber from native corporations in southeast Alaska is no longer sufficient to support previous levels.

Log exports from Alaska in fiscal 1989 were almost 630 million bd ft, but dropped to 500 million bd ft in fiscal 1991. In addition, a greater proportion of logs will be coming from south-central Alaska instead of southeast Alaska, so the quality will be lower than in the past.

Canadian log exports originate primarily from British Columbia. Volumes have never been more than about 20% of U.S. log exports. Log exports from British Columbia dropped from 2.8 million m^3 in 1988 to an estimated 800,000 m^3 in 1990 due to governmental restrictions.

The total timber harvest in British Columbia is also expected to decline, making any rebound in log exports politically impossible.

As the availability of North American logs for export declines, our primary customers are looking elsewhere. The harvest of radiata pine in New Zealand and Chile is expected to more than double during the 1990s. New Zealand's sale of half its state-owned forest plantations will accelerate the volume of log exports from that country.

In 1987, radiata pine accounted for only 3.5% of Japanese softwood log imports. In 1990, radiata's share (mostly from New Zealand) increased to an estimated 10.5%. South Korea's imports of radiata pine lately have exceeded Japan's. China has also increased imports of New Zealand logs.

The Soviet Union's log exports to Japan have declined in recent years, but in 1989 the USSR was the largest exporter of logs to China. South Korea has improved diplomatic relations with the USSR, and now Hyundai has also begun importing Russian logs. As North American logs become scarcer, more and more Japanese firms are arranging joint ventures in Siberia and the Soviet Far East to take advantage of the huge softwood resource there.

TABLE 1—Log, lumber exports from Oregon and Washington to Japan (million bd ft*)

Year	Logs	Lumber
1979	2960	356
1980	2344	362
1981	1604	312
1982	1738	414
1983	1591	448
1984	1519	414
1985	1617	472
1986	1769	672
1987	2049	851
1988	2021	1031
1989	2220	1090
1990	2058	990

** Scribner scale.*

Changing market conditions

Demand for wood imports in Japan began a slow shift from logs to lumber during the 1980s. Japan is by far the largest market for U.S. log exports, taking 65% of all U.S. softwood log exports in 1989 and close to 70% in 1990. Softwood log exports to Japan from Oregon and Washington dropped in volume by 30% between 1979 and 1990, while lumber exports to Japan increased about 180% (Table 1, Fig. 1).

The U.S. government and the National Forest Products Assn. have long been pressuring Japan to correct "unfair trading practices" and to open Japanese markets more to U.S. wood products. More U.S. and Canadian mills have begun producing sizes and specifications desired by Japanese customers. Trade promotion organizations such as the Evergreen Partnership in Washington have done an excellent job in fostering contacts between U.S. suppliers and Japanese customers.

Perhaps an even more important trend in the long run is the acute shortage of labor affecting all industry in Japan. The shortage is particularly troublesome in an industry that, according to Jerry Haver of Plum Creek Timber, is characterized in Japan by the "three Ks—Kitanai, Kiken, Kitsui (dirty, dangerous, difficult)."

There are not enough workers, maintains Haver, to process the logs Japan needs to supply its sawnwood demand. A shortage of skilled carpenters has caused a shift away from traditional post-and-beam construction toward modular homes and even 2x4 western-style housing.

While log imports from all sources will continue to be important for Japan, an increasingly larger share of imports will be composed of lumber instead of logs.

Ban on private logs next?

U.S. Rep. Peter DeFazio (D-Ore.) introduced a bill in 1990 that sought to prohibit the export of all logs, including those from private lands, from the United States. The bill died last year, but a similar measure was expected to be re-introduced this fall.

Its chances of passing are slim. Most economic studies show a net economic loss, due to jobs lost in logging and log exporting, loss of government timber revenues due to lower stumpage prices, etc.

Most important, a ban on log exports would mean lower stumpage prices for corporate and individual timberland owners of all sizes throughout the West. Because it would represent a blatant transfer of income from tree farmers to sawmill owners and workers, such an approach will probably not receive much popular support.

Finally, because such a ban would be a gross "taking" of private property rights, and would have repercussions far beyond the forest products industry, it may be too politically sensitive for Congress to act on. ■

THE AUTHOR is an economist with Jay Gruenfeld Associates, a Seattle, Wash., forest resource and management consulting firm.

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